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For: HIGH STRENGTH FABRIC AND STRUCTURE WITH UNIFORM THICKNESS AND A METHOD OF MAKING SAME

1           1. A high strength flexible fabric structure comprising:  
2                           a plurality of flexible fabric sections, each section including a  
3                           plurality of plies of alternating fiber orientation; and  
4                           a joint between adjacent sections wherein the plies of each section  
5                           are offset to form a uniform thickness seam between the two sections without any overlap  
6                           of plies of like fiber orientation.

1           2. The high strength flexible fabric structure of claim 1 in which there are at  
2                   least three plies in each section.

1           3. The high strength flexible fabric structure of claim 2 in which a first ply  
2                   has fibers oriented at 0° and 90°, a second ply has biased fibers, and a third ply has fibers  
3                   oriented at 0° and 90°.

1           4. The high strength flexible fabric structure of claim 3 in which the second  
2                   ply has fibers biased at  $\pm 45^\circ$ .

1           5. The high strength flexible fabric structure of claim 1 in which the ply  
2                   fibers are woven.

1           6.     The high strength flexible fabric structure of claim 1 in which the ply  
2     fibers are knitted.

1           7.     The high strength flexible fabric structure of claim 1 in which the ply  
2     fibers are unidirectional.

1           8.     The high strength flexible fabric structure of claim 1 in which the fibers of  
2     each ply are disposed in a flexible matrix material.

1           9.     The high strength flexible fabric structure of claim 8 in which the matrix  
2     material is a polyurethane resin material.

1           10.    The high strength flexible fabric structure of claim 1 in which the plies of  
2     each section are heat welded together.

3

4           11.    The high strength flexible fabric structure of claim 1 in which the plies of  
5     each section are laminated together.

1           12.    The high strength flexible fabric structure of claim 1 in which the sections  
2     are heat welded at the joint.

1                   13. The high strength flexible fabric structure of claim 1 in which the sections  
2                   are laminated at the joint.

1                   14. The high strength flexible fabric structure of claim 1 in which the structure  
2                   is a radome surrounding a radar system.

1                   15. The high strength flexible fabric structure of claim 2 in which a first  
2                   section includes an edge with a first ply thereof extending outward from a second ply  
3                   which extends outward from a third ply and the adjacent second section has an adjacent  
4                   edge with a first ply thereof offset inward of a second ply which is offset inward of a third  
5                   ply such that at the joint between the two sections, the first ply of the first section is  
6                   disposed on the second ply of the second section, and the second ply of the first section is  
7                   disposed on the third ply of the second section.

1                   16. The high strength flexible fabric structure of claim 1 in which there are at  
2                   least three plies in each section, the first ply having fibers oriented at 0° and 90°, the  
3                   second ply having biased fibers, and the third ply having fibers oriented at 0° and 90° and  
4                   in which the first section includes an edge with the first ply thereof extending outward  
5                   from the second ply which extends outward from the third ply and the adjacent second  
6                   section has an adjacent edge with the first ply thereof offset inward of the second ply  
7                   which is offset inward of the third ply such that at the joint between the two sections the  
8                   first ply of the first section is disposed on the second ply of the second section, and the  
9                   second ply of the first section is disposed on the third ply of the second section.

1           17. A high strength flexible fabric structure comprising:

2                           a plurality of flexible fabric sections, each section including a

3                           plurality of plies, each ply having fibers disposed in a flexible matrix; and

4                           a joint between adjacent first and second sections wherein:

5                                   the first section has an edge with a first ply thereof

6                                   extending outward from a second ply;

7                                   the second adjacent section has an edge with a first ply

8                                   thereof offset inward from a second ply; and

9                                   the first ply of the first section is disposed on the second ply

10                                   of the second section.

1           18. The high strength flexible fabric structure of claim 17 in which:

2                           the first section further includes a third ply offset inward from the

3                           second ply of the first section;

4                           the second adjacent section further includes a third ply extending

5                           outward from the second ply of the second section; and

6                           the second ply of the first section is disposed on the third ply of the

7                           second section.

1           19. The high strength flexible fabric structure of claim 18 in which the first ply

2                           of each section has fibers oriented at 0° and 90°, the second ply of each section has biased

3                           fibers, and the third ply of each section has fibers oriented at 0° and 90°.

1           20. The high strength flexible fabric structure of claim 19 in which the second  
2       ply has fibers biased at  $\pm 45^\circ$ .

1           21. The high strength flexible fabric structure of claim 17 in which the ply  
2       fibers are woven.

1           22. The high strength flexible fabric structure of claim 17 in which the ply  
2       fibers are knitted.

1           23. The high strength flexible fabric structure of claim 17 in which the ply  
2       fibers are unidirectional.

1           24. The high strength flexible fabric structure of claim 17 in which the flexible  
2       matrix is a polyurethane resin material.

1           25. The high strength flexible fabric structure of claim 17 in which the plies of  
2       each section are heat welded together.

1           26. The high strength flexible fabric structure of claim 17 in which the plies of  
2       each section are laminated together.

1           27. The high strength flexible fabric structure of claim 17 in which the  
2       sections are heat welded at the joint.

1           28. The high strength flexible fabric structure of claim 17 in which the  
2       sections are laminated at the joint.

1           29. The high strength flexible fabric structure of claim 17 in which the  
2       structure is a radome surrounding a radar system.

1                   31. The high strength flexible fabric structure of claim 30 in which the ply  
2                   fibers are woven

1                   32. The high strength flexible fabric structure of claim 30 in which the ply  
2                   fibers are knitted.

1                   33. The high strength flexible fabric structure of claim 30 in which the ply  
2                   fibers are unidirectional.

1                   34. The high strength flexible fabric structure of claim 30 in which the  
2 structure is a radome surrounding a radar system.

1           35. A flexible fabric structure with uniform seam thickness comprising:

2                   a first fabric section comprising:

3                           a first ply including a plurality of fibers oriented in a first

4                           direction;

5                           a second ply including a plurality of fibers oriented in a

6                           second direction;

7                           a third ply comprising a plurality of fibers oriented in the

8                           first direction; and

9                   a second fabric section comprising:

10                           a first ply including a plurality of fibers oriented in the

11                           first direction;

12                           a second ply including a plurality of fibers oriented in the

13                           second direction;

14                           a third ply including a plurality of fibers oriented in the

15                           first direction;

16                   wherein a joint between the first and second sections is structured

17                   and arranged such that the plies of the first section are in a staggered configuration with the

18                   plies of the second section such that the joint has a thickness the same as the thickness of

19                   the first and second fabric sections.

1           36. The fabric structure of claim 35 wherein the first direction is  $0^\circ$  and  $90^\circ$ .

1           37. The fabric structure of claim 35 wherein the second direction is  $\pm 45^\circ$ .

1           38. The fabric structure of claim 35 wherein the fibers are disposed in a  
2 flexible resin matrix material.

1                   39.     A method of manufacturing a high strength flexible fabric structure, the  
2     method comprising:

3 forming a plurality of flexible fabric sections to each include a  
4 plurality of plies of alternating fiber orientation;

5 offsetting the plies of each section; and  
6 joining adjacent sections such that no plies of like fiber orientation  
7 overlap.

1                   40. The method of claim 39 in which there are at least three plies in each  
2                   section

1           41. The method of claim 40 in which the first ply has fibers oriented at 0° and  
2           90°, the second ply has biased fibers, and the third ply has fibers oriented at 0° and 90°

1 42. The method of claim 41 in which the second ply has fibers biased at +45°

1           43. The method of claim 39 in which forming the flexible fabric sections  
2        includes weaving the ply fibers.

1                   44.     The method of claim 39 in which forming the flexible fabric sections  
2     includes disposing the fibers of each ply in a flexible matrix material.

1 45. The method of claim 44 in which the matrix material is a polyurethane

2 resin material.

1 46. The method of claim 39 in which joining of the sections includes heat  
2 welding the plies of each section together.

1 47. The method of claim 39 in which joining of the sections includes  
2 laminating the plies of each section together.

1 48. The method of claim 39 in which joining of the sections includes heat  
2 welding the sections at the joint.

1 49. The method of claim 39 in which joining of the sections includes  
2 laminating the sections at the joint.

1 50. The method of claim 39 further including the step of configuring the  
2 flexible fabric sections as a radome covering.

1 51. The method of claim 40 in which offsetting includes extending a first ply of  
2 a first section outward from a second ply thereof and extending the second ply outward  
3 from a third ply thereof and offsetting a first ply of the second section inward from a second  
4 ply thereof and offsetting the second ply thereof inward from a third ply thereof.

1 52. The method of claim 51 in which joining includes disposing the first ply of

- 2        the first section on the second ply of the second section and disposing the second ply of the
- 3        first section on the third ply of the second section.

1           53.    A method of producing a fabric structure of uniform thickness, the method  
2   comprising:

3                   forming a plurality of fabric sections; and  
4                   structuring and arranging each section to abut and join an adjacent  
5   section without any overlap between the sections and forming a fabric structure of  
6   uniform thickness.

1           54.    A method for producing a flexible fabric structure of uniform thickness,  
2    the method comprising:

3                           forming a first flexible fabric portion with a first ply of flexible  
4    fabric including a plurality of fibers oriented at 0° and 90°, a second ply of flexible fabric  
5    including a plurality of fibers oriented at  $\pm 45^\circ$ , and a third ply of flexible fabric including  
6    a plurality of fibers oriented at 0° and 90°,

7                           stacking the first, second, and third plies; and

8                           joining the first, second, and third plies with like oriented plies of a  
9    second flexible fabric portion in an offset configuration and forming a uniform thickness  
10   seam.

1           56. The high strength flexible fabric seam of claim 55 in which there are at  
2           least three plies in each section.

1           57. The high strength flexible fabric seam of claim 56 in which the first ply  
2        has fibers oriented at 0° and 90°, the second ply has biased fibers, and the third ply has  
3        fibers oriented at 0° and 90° .

1           58. The high strength flexible fabric seam of claim 57 in which the second ply  
2        has fibers biased at +45°.

1                   59. The high strength flexible fabric seam of claim 55 in which the ply fibers  
2 are woven.

1                   60. The high strength flexible fabric seam of claim 55 in which the ply fibers  
2                   are knitted.

1           61.    The high strength flexible fabric seam of claim 55 in which the ply fibers  
2           are unidirectional.

1           62. The high strength flexible fabric seam of claim 55 in which the fibers of  
2    each ply are disposed in a flexible matrix material.

1           63. The high strength flexible fabric seam of claim 62 in which the matrix  
2    material is a polyurethane resin material.

1           64. The high strength flexible fabric seam of claim 55 in which the plies of  
2    each section are heat welded together.

1           65. The high strength flexible fabric seam of claim 55 in which the plies of  
2    each section are laminated together.

1           66. The high strength flexible fabric seam of claim 55 in which the sections  
2    are heat welded together.

1           67. The high strength flexible fabric seam of claim 55 in which the sections  
2    are laminated together.

1           68. The high strength flexible fabric seam of claim 56 in which a first section  
2    includes an edge with the first ply thereof extending outward from the second ply which  
3    extends outward from the third ply and the adjacent second section has an adjacent edge  
4    with the first ply thereof offset inward of the second ply which is offset inward of the  
5    third ply such that the first ply of the first section is disposed on the second ply of the

6 second section, and the second ply of the first section is disposed on the third ply of the  
7 second section.

1 69. The high strength flexible fabric seam of claim 55 in which there are at  
2 least three plies in each section, the first ply having fibers oriented at 0° and 90°, the  
3 second ply having biased fibers, and the third ply having fibers oriented at 0° and 90° in  
4 which a first section includes an edge with the first ply thereof extending outward from  
5 the second ply which extends outward from the third ply and the adjacent second section  
6 has an adjacent edge with the first ply thereof offset inward of the second ply which is  
7 offset inward of the third ply such that the first ply of the first section is disposed on the  
8 second ply of the second section, and the second ply of the first section is disposed on the  
9 third ply of the second section.

1           70.    A high strength flexible fabric seam comprising:  
2                           at least two flexible fabric sections, each section including a plurality of  
3                           plies, each ply having fibers disposed in a flexible matrix wherein the first section has an  
4                           edge with a first ply thereof extending outward from a second ply;  
5                           the second adjacent section has an edge with a first ply thereof offset  
6                           inward from a second ply; and  
7                           the first ply of the first section is disposed on the second ply of the second  
8                           section.

1           71.    The high strength flexible fabric seam of claim 70 in which:  
2                           the first section includes a third ply offset inward from the second  
3                           ply of the first section;  
4                           the second adjacent section includes a third ply extending outward  
5                           from the second ply of the second section; and  
6                           the second ply of the first section is disposed on the third ply of the  
7                           second section.

1           72.    The high strength flexible fabric seam of claim 71 in which the first ply of  
2                           each section has fibers oriented at 0° and 90°, the second ply has biased fibers, and the  
3                           third ply has fibers oriented at 0° and 90°.

1           73. A flexible fabric seam with uniform thickness comprising:

2                   a first fabric section comprising:

3                           a first ply including a plurality of fibers oriented in a first

4                           direction;

5                           a second ply including a plurality of fibers oriented in a

6                           second direction;

7                           a third ply comprising a plurality of fibers oriented in the

8                           first direction; and

9                   a second fabric section comprising:

10                           a first ply including a plurality of fibers oriented in the

11                           first direction;

12                           a second ply including a plurality of fibers oriented in the

13                           second direction;

14                           a third ply including a plurality of fibers oriented in the

15                           first direction;

16                           wherein the plies of the first section are in a staggered configuration

17                           with and joined with the plies of the second section such that the seam has a thickness equal

18                           to a combined thickness of the first, second, and third layers of the first and second fabric

19                           sections.

1           74.     A method of manufacturing a high strength flexible fabric seam, the  
2     method comprising:

3 forming a plurality of flexible fabric sections to each include a  
4 plurality of plies of alternating fiber orientation;

5 offsetting the plies of each section; and

6 joining adjacent sections such that no plies of like fiber orientation  
7 overlap.

7 overlap.

1           75. The method of claim 74 in which offsetting includes extending the first ply  
2 of a first section outward from the second ply thereof and extending the second ply outward  
3 from the third ply thereof and offsetting the first ply of the second section inward from the  
4 second ply thereof and offsetting the second ply thereof inward from the third ply thereof.

1           76. The method of claim 75 in which joining includes disposing the first ply of  
2       the first section on the second ply of the second section and disposing the second ply of the  
3       first section on the third ply of the second section

1           77.    A method of manufacturing a high strength flexible fabric seam, the  
2    method comprising:

3                           forming a plurality of flexible fabric sections to each include at  
4    least three of plies of alternating fiber orientation;

5                           offsetting the plies of each section;

6                           joining adjacent sections such that no plies of like fiber orientation  
7    overlap;

8                           weaving the ply fibers; and

9                           disposing the fibers of each ply in a flexible matrix material.

1           78.    A radome structure comprising:  
2                   a plurality of flexible fabric sections, each section including a  
3                   plurality of plies of alternating fiber orientation; and  
4                   a joint between adjacent sections wherein the plies of each section  
5                   are offset to form a uniform thickness seam between the two sections without any overlap  
6                   of plies of like fiber orientation.